REMARKS

Status of the Claims

Claims 1-4, 6-14, 23-30, 33-41, 44-51, and 57-60 are pending in the application, of which claims 1, 23, 30, 34, 37, 38, 40, 44, and 57 are being amended, and claim 60 is being added. Claims 15-22 and 52-56 are being canceled as drawn to a non-elected invention.

Applicant requests entry of the claim amendments and added claims, which are fully supported by the specification and original claims and add no new matter. Claim 34 is being amended *solely* to correct for a grammatical error, and said amendment does not change the scope or meaning of the claim. Reconsideration of the claims remaining in the application is respectfully requested in view of the amendments and remarks herein.

102(b) Rejection of Claims 30, 33-35, 38, and 39

The Examiner rejected claims 30, 33-35, 38 and 39, under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,002,631 to Giapis et al. (Giapis et al.) This rejection is respectfully traversed.

As amended, claims 30 and 38 are to a substrate etching apparatus comprising, inter alia, "a sample detector to detect a reflected radiation from the substrate or a chamber wall and generate a sample signal", "a reference detector to detect a reference radiation from the radiation source and generate a reference signal," and "a signal analyzer adapted to normalize the sample signal relative to the reference signal by mathematically operating on the sample signal with the reference

signal to generate a normalized signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal," which are not taught by Giapis et al. Although Giapis et al. provides optical sources (161, 162), and detectors (163, 164, 165), Giapis et al. does not disclose "a signal analyzer adapted to normalize the sample signal relative to the reference signal" to "determine a thickness of a layer being etched." Thus, claims 30 and 38 as amended, and the claims dependent therefrom, including claims 33-35 and 39, are not anticipated by Giapis et al.

102(e) Rejection of Claims 40-51 and 57-59

The Examiner rejected claims 40-51 and 57-59 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,299,346 to Ish-Shalom et al. (Ish-Shalom et al.). This rejection is respectfully traversed.

Notice 11 of the Official Gazette of February 27, 2001, titled "Guidelines for 35 U.S.C. 102(e)(2)" sets forth the USPTO interpretation of 102(e)(2) as amended by the AIPA. Section VI, Example 2 states "a patent issued from such application would be accorded the prior application's filing date as its 102(e) prior art date assuming that the prior application provides proper support for the relied upon subject matter." (Emphasis added.)

The instant application has a filing date of August 24, 1999, whereas Ish-Shalom et al. has a filing date of March 7, 2000, and the provisional application 60/123,371 from which Ish-Shalom et al. claims priority has a filing date of March 8, 1999. A copy of the provisional application discussed is enclosed herewith.

Ish-Shalom et al. is not entitled to the effective filing date of the provisional application 60/123,371 because the provisional application does not provide

proper support for the subject matter relied on by the Examiner. The Examiner relies on a "control system (36)" described in column 11, lines 8-15, of Ish-Shalom et al. that "provides incident radiation (40) intermittently by turning radiation source (28) on and off." However, this control system is not described in the provisional application. Rather than turning on and off a radiation source, the provisional application describes "subtract[ing] the contribution of the various background sources" (Page 2.) The teaching of subtracting contributions of background sources in the provisional application clearly does not support the teaching of the control system (36) to intermittently turn on/off the radiation source (28). Therefore, Ish-Shalom et al. is not entitled to the effective filing date of the provisional application 60/123,371, and instead Ish-Shalom et al. has a later effective filing date of March 7, 2000, which does not qualify Ish-Shalom et al. as prior art under 102(e).

Thus, claims 40, 44, and 57, and the claims dependent therefrom, including claims 41-43, 45-51, 58, and 59, are not anticipated by Ish-Shalom et al. (not prior art)

103(a) Rejection of Claims 1-4, 6, 11-14, and 36

The Examiner rejected claims 1-4, 6, 11-14, and 36 under 35 U.S.C. 103(a) as being unpatentable over Giapis et al. in view of Japanese Patent 01260304 to Taketora Saka (Saka). This rejection is respectfully traversed.

Claims 1 and 30

As amended, claims 1 and 30 are allowable over Giapis et al. because Giapis et al. fails to teach a substrate etching apparatus comprising, inter alia, "a signal analyzer adapted to normalize the sample signal relative to the reference

signal to generate a normalized signal," as recited in claims 1 and 30. There is no disclosure in Giapis et al. of a component adapted to normalize one signal relative to another signal to generate a normalized signal.

Saka does not make up for the deficiencies of Giapis et al. because Saka also does not teach or suggest the substrate etching apparatus. Instead, Saka describes coating an object with a resist film. An apparatus adapted to etch a substrate is not the same as an apparatus adapted to coat an object with a resist film. For example, a coating apparatus does not comprise "a chamber capable of etching a substrate," the chamber comprising, inter alia, "a gas distributor to introduce an etchant gas into the chamber" and "a gas energizer to energize the etchant gas."

Furthermore, it would not have been obvious to one of ordinary skill to combine Saka with Giapis et al. For example, there would not have been motivation for one of ordinary skill to combine these references because Saka discloses performing a thickness measurement of a wet resist that is being coated onto a substrate. The thickness is determined according to the absorption by dissolved solute of a light beam passing through the wet resist as the resist film is being applied (page 5). One would not be motivated to apply this method to the etching of a substrate because Saka emphasizes that the method can only be used for measuring the thickness of a wet resist film as it is being applied. For example, Saka teaches against measuring the thickness of a dry resist film (such as a film that is being etched) when it states "[i]n order to measure the thickness of resist film (3) by employing the intensities of incident light (1) and reflected light (2), the light *must* be measured *before* the resist solvent has evaporated." (Page 5, lines 1-3. Emphasis added.) Thus, there would not have been motivation to use the teachings of Saka for a wet resist film to derive claims 1 or 30 in order to *more accurately determine endpoint of*

an etching process by mathematically operating on a sample signal with a reference signal.

Claims 1 and 30 recite detectors to "generate a sample signal" and a "reference signal," and "a signal analyzer adapted to normalize the sample signal relative to the reference signal ... and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal." The normalized signal can advantageously provide a more accurate thickness measurement during the etching process by compensating for intensity fluctuations of light that is incident on the substrate or chamber wall being etched.

Thus, claims 1 and 30, and the claims dependent therefrom, including claims 1-4, 6, 11-14, and 36; are allowable over Giapis et al. in view of Saka.

103(a) Rejection of Claims 7-10, 23-29, and 37

The Examiner rejected claims 7-10, 23-29, and 37 as being unpatentable over Giapis et al. in view of Saka, as applied to claims 1-4, 6, 11-14, and 36 above, and further in view of Japanese Patent 60-12732 to Kubota et al. (Kubota et al.) This rejection is respectfully traversed.

Claim 1

Giapis et al. fails to teach "a signal analyzer adapted to normalize the sample signal relative to the reference signal to generate a normalized signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal," as recited in claim 1. Although Giapis et al. teaches "receiving light from the workpiece or plasma," there is no disclosure in Giapis et

al. of "a signal analyzer adapted to normalize the sample signal relative to the reference signal to generate a normalized signal."

Saka does not make up for the deficiencies of Giapis et al. because there would have been no motivation to one of ordinary skill to combine the resist film coating apparatus of Saka with the substrate etching apparatus of Giapis et al. For example, Saka emphasizes that the resist film "must" be wet during the thickness measurement, precluding the possibility of thickness measurement of a dry film, such as a film that is being etched. Thus, there would have been no motivation to one of ordinary skill to combine the teachings of Saka and Giapis et al., as discussed above.

Kubota et al. fails to make up for the deficiencies of Giapis et al. and Saka because there would have been no motivation to one of ordinary skill to combine the teachings of Kubota et al. with the teachings of Saka. Kubota et al. describes exposing a wafer having a resist layer with a light beam, and measuring a thickness of the resist layer to determine an optimum time for exposure. An apparatus adapted to *expose* a wafer with a light beam is sufficiently different from an apparatus adapted to *etch* a substrate that there would have been no motivation to one of ordinary skill to combine the teachings from the exposure apparatus of Kubota et al. with the etching apparatus of Giapis et al.

Thus, claim 1 and the claims dependent therefrom, including claims 7-10, are allowable over Giapis et al., Saka, and Kubota et al.

Claim 23

Neither Giapis et al., Saka, nor Kubota et al. teach "a signal analyzer adapted to receive the sample signal and determine a corrected sample signal, X_{nt}, using the expression $X_{nt} = X_t / \{Y_0 + C(Y_t - Y_0)\}$, where C is a correction factor, Y_0 is a reference signal at time 0, X_t is the sample signal at time t, and Y_t is the reference signal at time t." The Examiner acknowledges that "[b]oth Giapis and Taketora Saka do not teach a signal analyzer that is adapted to determine a corrected sample signal by applying a correction factor to the normalized signal."

The Examiner relies on Kubota et al., but Kubota et al. also fails to teach a signal analyzer that is adapted to determine a corrected sample signal by applying a "correction factor". Thus, claim 23 and the claims dependent therefrom, including claim 24-29, are allowable over Giapis et al., Saka, and Kubota et al.

Claim 30

Giapis et al. fails to teach a substrate etching apparatus comprising, inter alia, "a signal analyzer adapted to normalize the sample signal relative to the reference signal to generate a normalized signal," as recited in claim 30. There is no disclosure in Giapis et al. of a component adapted to normalize one signal relative to another signal to generate a normalized signal.

Saka does not make up for the deficiencies of Giapis et al. because there would have been no motivation to one of ordinary skill to combine the resist film coating apparatus of Saka with the substrate etching apparatus of Giapis et al. For example, Saka emphasizes that the resist film "must" be wet during the thickness measurement, precluding the possibility of thickness measurement of a dry film, such as a film that is being etched. Thus, there would have been no

motivation to one of ordinary skill to combine the teachings of Saka and Giapis et al., as discussed above.

Kubota et al. fails to make up for the deficiencies of Giapis et al. and Saka because there would have been no motivation to one of ordinary skill to combine the teachings of Kubota et al. with the teachings of Saka. An apparatus adapted to *expose* a wafer with a light beam is sufficiently different from an apparatus adapted to *etch* a substrate that there would have been no motivation to one of ordinary skill to combine the teachings from the exposure apparatus of Kubota et al. with the etching apparatus of Giapis et al.

Thus, claim 30 and the claims dependent therefrom, including claim 37, are allowable over Giapis et al., Saka, and Kubota et al.

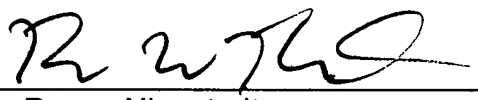
Conclusion

The claims are allowable at least for the reasons given above. The Examiner is respectfully requested to reconsider the present rejections and allow the pending claims. Should the Examiner have any questions, the Examiner is requested to call the undersigned representative of the Applicant.

Respectfully submitted,

JANAH & ASSOCIATES
A PROFESSIONAL CORPORATION

Dated: September 17, 2002

By: 

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MARKED-UP CLAIMS (A/N 09/379,753)

1. (thrice amended) A substrate [processing] etching apparatus comprising:

(a) a chamber comprising a substrate support to support a substrate, a gas distributor to introduce an etchant gas into the chamber, a gas energizer to energize the etchant gas, a gas exhaust to exhaust gas from the chamber, and a radiation source;

(b) one or more detectors to (i) detect an intensity of a first radiation originating from the radiation source and reflected from [a] the substrate or a chamber wall and generate a sample signal, and (ii) detect an intensity of a second radiation emitted from the radiation source and generate a reference signal; and

(c) a signal analyzer adapted to normalize the sample signal relative to the reference signal by mathematically operating on the sample signal with the reference signal to generate a normalized signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal.

23. (twice amended) A substrate [processing] etching apparatus comprising:

(a) a chamber capable of [processing] etching a substrate, the chamber comprising a substrate support to support the substrate, a gas distributor to introduce an etchant gas into the chamber, a gas energizer to energize the etchant gas, a gas exhaust to exhaust gas from the chamber, and a radiation source;

(b) a detector to detect a reflected radiation from the substrate or a chamber wall and generate a sample signal; and

(c) a signal analyzer adapted to receive the sample signal and determine a corrected sample signal, X_{nt}, using the expression $X_{nt} = X_t / \{Y_0 + C(Y_t - Y_0)\}$,

where C is a correction factor, Y_0 is a reference signal at time 0, X_t is the sample signal at time t, and Y_t is the reference signal at time t.

30. (twice amended) A substrate [processing] etching apparatus comprising:

(a) a chamber capable of [processing] etching a substrate, the chamber comprising a substrate support to support the substrate, a gas distributor to introduce an etchant gas into the chamber, a gas energizer to energize the etchant gas, a gas exhaust to exhaust gas from the chamber, and a radiation source;

(b) a sample detector to detect a reflected radiation from the substrate or a chamber wall and generate a sample signal;

(c) a reference detector to detect a reference radiation from the radiation source and generate a reference signal; [and]

(d) one or more first fibers to transmit the reference radiation from the radiation source to the reference detector and one or more second fibers to transmit the reflected radiation from the radiation source to the chamber, the first and second fibers arranged to receive radiation from one or more areas of the radiation source that have about the same size; and

(e) a signal analyzer adapted to normalize the sample signal relative to the reference signal by mathematically operating on the sample signal with the reference signal to generate a normalized signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal.

34. (twice amended) An apparatus according to claim 30 wherein the first and second fibers are arranged to have substantially overlapping [field] fields of [views] view.

37. (twice amended) An apparatus according to claim 30 further comprising a signal analyzer to receive the reference and sample signals and normalize [one] the sample signal relative to the [other] reference signal to generate a normalized signal by mathematically operating on the sample signal with the reference signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal [, and optionally, to correct the sample signal for background radiation].

38. (twice amended) A substrate [processing] etching apparatus comprising:

(a) a chamber capable of [processing] etching a substrate, the chamber comprising a substrate support to support the substrate, a gas distributor to introduce an etchant gas into the chamber, a gas energizer to energize the etchant gas, a gas exhaust to exhaust gas from the chamber, and a radiation source that includes a plasma;

(b) a sample detector to detect a reflected radiation from the substrate or a chamber wall and generate a sample signal;

(c) a reference detector to detect a reference radiation from the plasma and generate a reference signal; [and]

(d) one or more fibers to transmit the reference radiation to the reference detector, the fibers arranged to receive reference radiation which is not reflected from the substrate; and

(e) a signal analyzer adapted to normalize the sample signal relative to the reference signal by mathematically operating on the sample signal with the reference signal to generate a normalized signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal.

40. (thrice amended) A substrate [processing] etching apparatus comprising:

(a) a chamber comprising a substrate support to support a substrate, a gas distributor to introduce an etchant gas into the chamber, a gas energizer to energize the etchant gas, a gas exhaust to exhaust gas from the chamber, and a radiation source other than a plasma in a process zone in the chamber;

(b) one or more detectors to detect an intensity of a first radiation reflected from [a] the substrate or a chamber wall to determine a thickness of a layer on the substrate or chamber wall, and detect an intensity of a second radiation from the radiation source; and

(c) a feedback controller adapted to regulate a power level of the radiation source in relation to the detected intensity of the second radiation.

44. (thrice amended) A substrate [processing] etching apparatus comprising:

(a) a chamber comprising a substrate support to support a substrate, a gas distributor to introduce an etchant gas into the chamber, a gas energizer to energize the etchant gas, a gas exhaust to exhaust gas from the chamber, and ;

(b) a radiation source capable of generating a radiation;

(c) a first detector to detect a property of the radiation from the radiation source and generate a reference signal in relation to the property;

(d) a radiation modulator in a path of a radiation being transmitted from the radiation source to the chamber, the radiation modulator being adapted to receive the reference signal and control a property of the radiation in relation to the reference signal; and

(e) a second detector in a path of the radiation, the second detector capable of detecting an intensity of the radiation reflected from [a] the substrate or a chamber wall to determine a thickness of a layer being etched on the substrate or chamber wall.

57. (twice amended) A substrate [processing] etching apparatus comprising:

a chamber comprising a substrate support to support a substrate, a gas distributor to introduce an etchant gas into the chamber, a gas energizer to energize the etchant gas, a gas exhaust to exhaust gas from the chamber, and a radiation source;

one or more detectors to detect an intensity of [the] a radiation reflected from [a] the substrate or a chamber wall to generate a sample signal that may be used to determine a thickness of a layer being etched on the substrate or chamber wall, and to detect a property of a radiation from the radiation source and generate a reference signal in relation to the property; and

a feedback controller adapted to regulate a power level of the radiation source in relation to the reference signal [, wherein the feedback controller is adapted to maintain the property of the radiation at a substantially constant level].